MONITORING A NATIONAL CONSTRUCTION IT PROGRAMME

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ABSTRACT: The context of the paper is the Finnish national VERA (Information Networking in the Construction Process) technology programme (see http://cic.vtt.fi/vera/english.htm). The target of the programme is to promote the implementation and use of IT and information networks as an enabler for re-engineering the construction process.

The paper describes the current status of the VERA programme after the first three years 1997-1999, the monitoring (midterm assessment) process and its results. One domestic and one international evaluator carried out the monitoring: Kaj Hedvall from Rakli and Professor Matthew Bacon from BAA. Innovation Management Institute of Tampere University of Technology facilitated the monitoring process. The issues of the monitoring report were:
- whether or not industry's expectations have been met by the VERA programme
- are the results of the projects well disseminated and is industry applying those results
- what are the indicators that would demonstrate change and improvement
- where projects have been successful what are the reasons for success, and likewise where projects have not achieved their expectations, then why not
- are the goals of the programme still valid or should the future focus be changed

The paper will also present some recommendations for Tekes and the VERA programme.

KEYWORDS: Construction IT, Technology Programme, Monitoring

1. CURRENT PROJECT SITUATION IN VERA PROGRAMME

VERA (Information Networking in the Construction Process) is a Finnish national technology programme. The target of the programme is to promote the implementation and use of IT and information networks as an enabler for re-engineering the construction process. The programme started 1997 and it will last for 6 years, until the end of 2002.

1.1 Original budget

Tekes funding	~70 million FIM	~11.8 million €	41 %
Industry funding	~100 million FIM	~16.8 million €	59 %
Total budget	~170 million FIM	~28.6 million €	

1.2 Current budget estimation

Tekes funding	~100 million FIM	~16.8 million €	43 %
Industry funding	~130 million FIM	~21.9 million €	57 %
Total budget	~230 million FIM	~38.7 million €	

1.3 Current project situation

Research institutes	31 projects	20 million FIM	3.3 million €	14 %
Industrial companies	70 projects	120 million FIM	20.2 million €	86 %
Total allocation	101 projects	140 million FIM	23.5 million €	

Tekes funding	Research	14 million FIM	2.4 million €	70 %
	Industrial	53 million FIM	8.9 million €	44 %
	Total	67 million FIM	11.3 million €	48 %

The main indication of the industry interest and activity on the VERA development area has been the need to expand the expected total budget by 35 %.

Short project presentations are available at http://cic.vtt.fi/vera/english.htm

2. MONITORING REPORT

The following part, chapter 2.1 through to chaper 2.2.8 isan abridged version of the monitoring report. The full report can be found in http://cic.vtt.fi/vera/document/Monitoring_Report_2000.pdf [1]

2.1 Monitoring Work

The overall aim of the monitoring was to assess the present state of the programme and the realised impacts to the industry as well as to challenge the validity of VERA objectives.

Co-ordination and internal assessment work was carried out by Innovation Management Institute of Tampere University of Technology; Pekka Berg, Satu Raak, Juha Nummi and Jussi Pihlajamaa. Professor Mathew Bacon from BAA, Great Britain and Kaj Hedvall, the Programme Manager of Rembrand technology programme carried out external assessments.

The focus of Professor Matthew Bacon's assessment was to assess (1) whether the expectations of the construction industry have been or are being met, (2) how well the results are disseminated and whether the mechanisms for dissemination are appropriate and (3) how the industry is applying the results. The assessment was carried out by interviewing ten projects, which were mostly completed/completing.

Kaj Hedvall's assessment focused on (1) whether the role of VERA as a generic tools programme for the entire real estate and construction industry is being met, (2) what is the interaction between VERA and the other technology programmes and (3) what are the benefits of VERA the projects and what is the contribution of the projects to the VERA initiatives. The assessment was carried out by interviewing ten projects that were more closely related to property management and real estate business.

The internal assessment focused on (1) the hoped for and so far reached impacts, (2) outputs/results and (3) activities of the programme management of VERA. The work was carried out as top-down assessment (interviews and workshops for Steering Committee members) and bottom-up assessment (15 interviews and 48 answers from the postal survey from the projects). The aim of the internal assessment as a whole was to provide as an objective information as possible to the Steering Committee for decision making.

2.2 Monitoring Findings

The stated objective of VERA programme is: "…to promote the utilisation of product information technology and information networks in the construction processes and to make it possible to manage information flows during the entire life cycle of a building." The stated themes are seen in Figure 1. The programme has identified that at the heart of VERA must be the recognition of the synergies that exist between each of the five themes. For the moment there seems, however, to be no clear mechanism of where the synergies are identified. It was seen that the synergies would become self evident to some extent through the process of gathering the learning from the projects. The greatest synergy of all will be understood through way in which people and organisations work in new construction and real estate business processes, enabled through IT to share data across information networks over the life cycle of the facilities.

The general feeling of many project participants was that VERA is a programme of a single issue having "core" projects and "fringe" projects. Participants commenting this regarded themselves as "fringe" projects. Answers from the projects in the "core" indicated, however, that the "core" of VERA is in fact diverse rather than focusing just on single issues. In any case, such attitudes were assessed to be a threat for achieving all the potential synergies created or to be created in VERA.
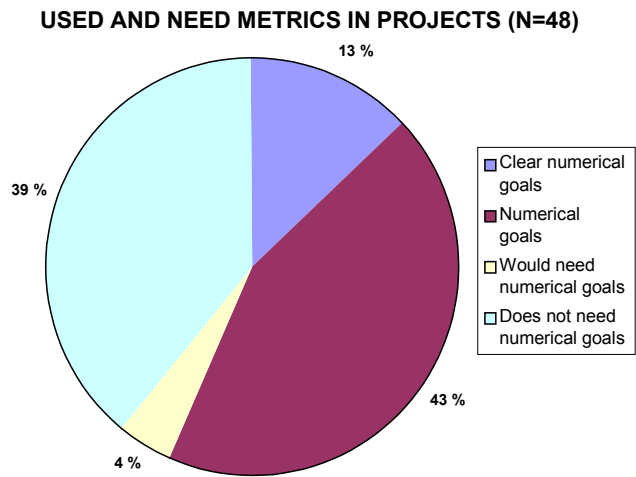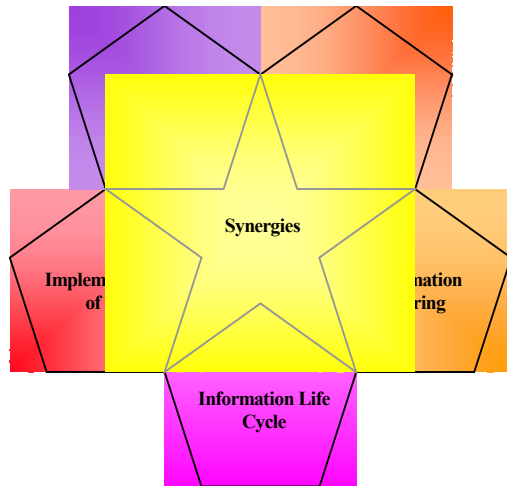

Figure 1. The programme themes

Figure 2. Numerical goals used in the projects

2.2.1 Direct impacts

The so far realised direct impacts of VERA cannot be quantified. Within the projects Professor Matthew Bacon interviewed there was no attempt made to measure the efficiency of current working practices or to produce any form of cost benefit model. Some projects did recognise the importance and the need for metrics but complexities of establishing robust metrics were perceived too difficult to address.

The projects were also asked in the internal assessment whether they had set numerical goals (Figure 2). The outcome is different from the previously described one. Most of the projects did not, however, define what the metrics were or they were very imprecise. Among the most commonly mentioned metrics were: budget, scheduling, sales volume, market share, number of (new) customers, customer satisfaction, turnover, profitability, share of exports.

2.2.2 National level impacts

National level impacts of VERA were discussed in the interviews and workshops of the steering committee. Increase in the national level competitiveness as well as increase in the productivity and the competitiveness of the property sector were seen important hoped for impacts. Whether any of these impacts has already been obtained, was considered minor importance and hard to evaluate at this point in the steering group.

The integration problem in the construction and real estate industry and the lack of common will to communicate across the border lines were seen as hindrance in reaching industry level impacts in the first three years. Improvements in the atmosphere, attitudes as well as awareness were, though, already seen to have been taking place in the construction and real estate industry.

2.2.3 Impacts on the construction and real estate industry

The projects as well as the Steering Committee members were asked about their opinions of the significance of the already obtained impacts to the entire construction and real estate industry (Figure 3).

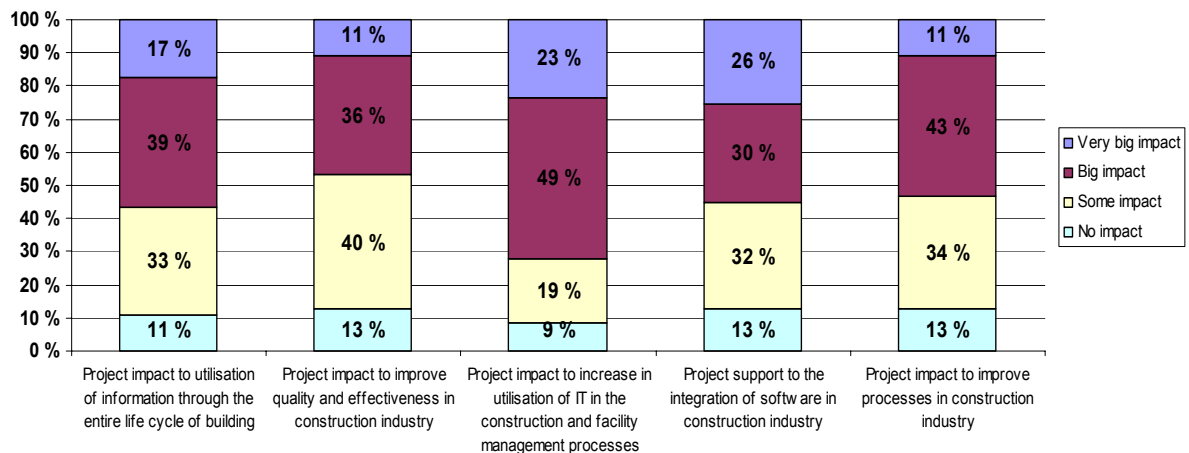**PROJECTS IMPACTS TO ENTIRE CONSTRUCTION INDUSTRY (N=48)**

Figure 3. Opinions of the projects about the significance of the impacts so far in VERA

According to the Steering Committee there has already been many positive improvements and promising results in some of the projects, but not yet for the industry as a whole. Expectations are quite high for the last three years. More emphasis is especially needed within the life cycle concept as well as process re-engineering to enhance those impacts. During the monitoring work, management of information through the entire life cycle of a building was raised as the most important issue to which the other impacts should be connected.

2.2.4   Indirect impacts

In contrast to the direct impacts, the indirect impacts were found significant to the construction industry as well as to the real estate industry. The majority of the project members saw benefits from the projects in which they had participated.

Themes that consistently appeared in the interviews of the construction industry projects were: (1) much improved awareness of the issues that need to be addressed in terms of information technology, (2) indirect learning of the participants in general and (3) need to have start-up briefing for all participants of the project to educate the project partners in the key concepts relevant to the project.

Themes number 1 and 2 (above) also came up in the interviews of the real estate and property management projects. In these projects it was regarded especially important that project participants were ready and available when the market was demanding IT-tools to manage the information.

In the software business the situation was different since the IT-products are their core business. The projects found the development work very important in terms of renewing their core products. These projects were seen as creating a competence to work in open and modular environments, all be it, only inside the firms of the participants.

As a whole, it appeared that interoperation was in practice being limited to creating readiness for data exchange between separate applications. The success of developing the joint parts in the programme integration was considered less than expected. One reason for the limited success to create programme integration was the rapid change in the business environment during the projects. In several cases, where major changes had occurred in the business structures and strategies, even the indirect impacts of the projects were found hard to assess.

2.2.5 Nature of the projects

The development projects of VERA seemed to support business operations of the companies very well (Figure 4). The success of the projects was also found successful or having no difference compared to other development projects of the organisation. The same trend was seen when the participants were asked how problematic the project had been in comparison to the other development projects of the company. In other words the majority of the participants considered that VERA projects had no more problems or even less problems than the other development projects in the organisation.
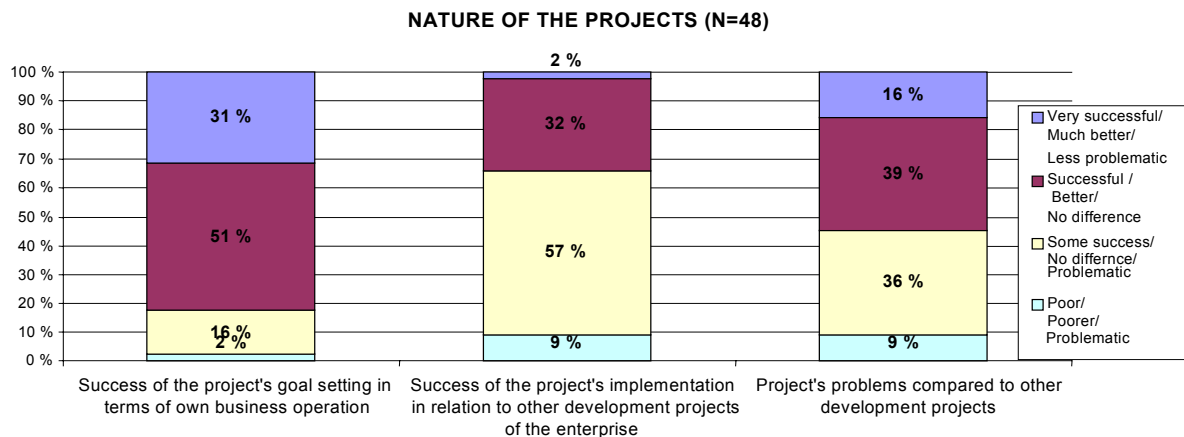

Figure 4. Nature of the project in terms of success in the goal setting and success in the project implementation and existing problems in relation to other development projects.

The result can be considered expected as the majority of VERA projects are close to the business and thus mostly applied compared to many other technology programmes. Another reason for such an outcome is probably the lower risk level in the construction industry in general than in other industries. It can be concluded that the answers of the projects in the internal assessment support well the external assessments - the indirect impacts of VERA are in deed significant to the construction industry as well as to the real estate industry.

2.2.6 Activities of the programme management

Among the projects, the three most important supporting activities of VERA were (1) impacts to common attitudes (86 %), (2) programme information (63 %) and (3) the support from the programme manager (62 %). These activities, including the programme seminars, were also regarded as the most well managed. As a whole VERA was found well managed (Figure 5). The professionalism of the programme manager, his time availability and the information provided were regarded as of high quality.
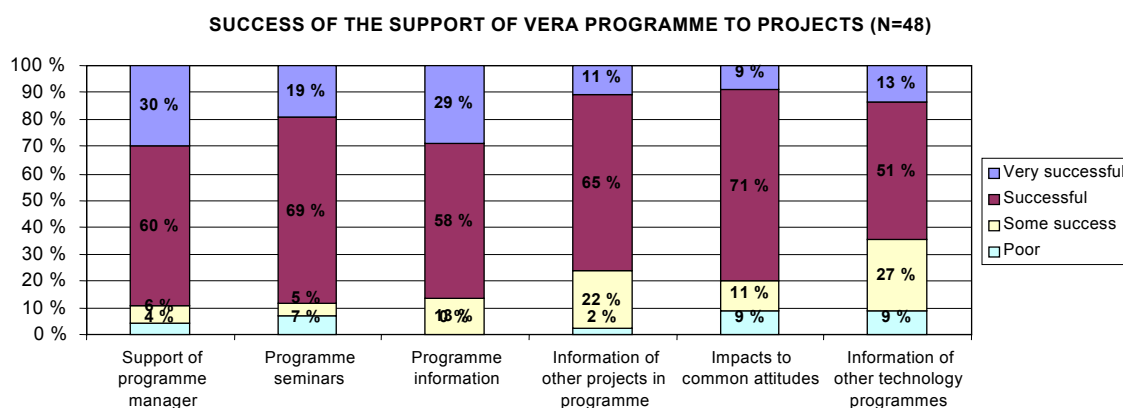

Figure 5. Success of the activities arranged by VERA programme

In general the interaction between the projects was observed rather minimal and contacts to the research projects almost non-existent. The awareness of the Finnish research projects of construction and real estate fields was regarded as very low among the projects. The content of the general information of VERA was assessed homogenous. Among the "fringe" projects international co-operation was found to be too much focused on IAI/IFC issues.

2.2.7 Impact of the Tekes funding

Without Tekes funding 35% of the projects would not have started at all and 55% of the projects would have been implemented differently. 10% did not answer this question or had no opinion, but none of the projects answered that they would have implemented the project to the same extent without Tekes funding.

As a whole, Tekes funding was regarded as important and extremely helpful. Strategic projects and technically high risk projects were seen in great demand for Tekes support. Whether the project was put into a certain programme or into a programme at all, was in minor importance for many of the participants. In other words the ultimate goal of many projects was to get Tekes funding.

There is much potential to make a direct impact. It was assessed, however, that not enough had been done to achieve the objective of VERA. The essence of the message to Tekes must be that a rich body of work has been undertaken, and the results of that work hold huge potential for exploitation. Nevertheless the success of Tekes and VERA programme to realise that potential will be dependent on the willingness of people in the industry to change.

2.2.8 Validity of VERA objectives

There was no strong evidence to question the objectives of VERA programme or to set more ambitious goals. However, some findings indicated that the Steering Committee needs to enhance and clarify some objectives. The monitoring team made the following suggestions:

1. The need to deal with the question of VERA being a generic tools programme for the entire real estate cluster or a programme concentrating on the integration of the design and construction processes.

2. The need to understand how to effect change in working practises. There is a call for both believing and understanding the need for change.

3. The need to promote the concept of process management tools concerning the goal of construction process.

4. The need to identify coherently and clearly the impacts, goals and outputs serving as base for the value model.

5. The need to focus the programme more towards the customer/user, to create a market pull for the technologies developed. By trying to induce change in the organisational processes of e.g. real estate owners, the programme can create markets for various IT products as well as valuable information about future demand of them.

VERA has fulfilled its role as a generic tools programme as the scope and focus of the projects are diverse. There were many approaches in the assessed projects related to real estate business and property management, some being very far from the "core" projects.

The extent to which VERA has been able to increase the integration between the various fields in the industry was, on the other hand, less clear. There seemed to be an increased awareness of the importance of openness and interoperability, but the networks were seen on the firm level consisting of strategic alliances between producers or between the client and the producer. Neither were many really strong links observed between the "core" and the "fringe" projects of VERA.

3. CONCLUSIONS FROM THE MONITORING PROCESS

The main reason for the monitoring process was to assess the current situation and improve the activities in VERA over the last three years. The monitoring process gave valuable knowledge for the future work, especially the recommendations from the external assessment by Professor Matthew Bacon and Kaj Hedvall. But the report also contains some conclusions, which are not possible to implement or at least would demand significant changes in the Tekes funding mechanism, and are therefore not VERA specific issues. Of course Tekes can also consider these comments in the development of technology programmes in the future.

The internal monitoring method was based on Pekka Berg's doctoral thesis published in 1999 [2]. Regarding the experiences in VERA monitoring process, the method seems likely to be more appropriate to evaluation in the end of programme. Currently it makes a clear distinction between evaluation and monitoring only in terminology, but the method in both processes is about the same. To be able to develop the method further the authors have recorded some of their findings during the VERA monitoring process:

1. It is difficult or impossible to measure results of a programme in the mid-term phase. The monitoring process should concentrate more to the programme objectives and activities, not trying to measure the results.

2. The division in research and industrial projects is very important to the programme management. Now this distinction has been mostly ignored in reporting the results.

3. In the questionnaires the lack of definition in terminology caused non-coherent answers, because people understood the questions very differently. Conclusions based on the answers are very difficult to trust if the basis for them is not clear. In this evaluation the translation between Finnish and English also sometimes blurs the terminology.

4. Lot of time in the monitoring process was devoted to the categorisation to three different project stages, starting, on-going and finished projects, and to the comparison of the three categories to see if the goals for projects will change during the process. This part, comparing different projects at different stages, did not bring value for the monitoring.

5. The individual answers were confidential, which of course is necessary when projects are expected to criticise their funding body. Never the less, the lack of transparency in some parts makes it difficult to estimate the real meaningfulness of comments. Example of this problem are the "many comments" of "core" versus "fringe" projects. How many, and which type of projects? It would be important to publish the percentages about all meaningful comments, now some vocal comments can easily be overrated in the report. The criticism against division to "core" and "fringe" projects and that the "core" projects would have "much more comprehensive view about the objectives and the potential results as well as threats and risks of the IFC work" seems to be based on a emotional opinion of some projects seeing themselves as "fringe" projects. All projects have the same access to all IAI/IFC information. If someone does not use the access, it can not be solved by the activities of Steering Committee or Programme Manager.

6. In some parts, the conclusions reflect ignorance of the basic roles and responsibilities of Tekes, Programme Manager and Steering Committee. The Steering Committee consists of experts in some leading industry companies in this field, but it does not evaluate, or even get any material on the industrial R&D projects, they can only evaluate public projects by universities and other research institutes. This is a necessity because of the industry competition; it is hardly possible that a body of industrial people could see the R&D strategies and plans of their competitors. It is also not possible to expand the work of the Steering Committee to include information management or "focus on more efficient knowledge and result capture and dissemination both in VERA among the

projects and from VERA towards industry." The Steering Committee defines strategies and the Programme Manager is responsible of the actions in co-operation with Tekes.

7. The criticism against the lack of interaction between projects and the lack of information about research projects is well justified. Therefore it is rather peculiar to suggest that the solution would be to "list the central national and international links" on the web site. All the projects, and some external links are already there, but the projects complaining the lack of interaction are obviously not using them. The solution can hardly be "more links". This is a serious problem, which should be solved, but it needs more comprehensive actions, perhaps even changes in the agreement terms between projects and Tekes. Now nobody can force companies to share the information, all results are totally their property.

The above criticism against some details in the monitoring report does not mean that the authors would not accept the main conclusions and recommendations of the monitoring team. In technology programmes like VERA there is a lot of work to improve the gathering of learning and use of results from projects. The following list is based on the recommendations of the monitoring team, but the authors have rearranged and addressed the recommendations to the right body. Original recommendations of the monitoring team and the full report can be found at: http://cic.vtt.fi/vera/document/Monitoring_Report_2000.pdf

4. RECOMMENDATIONS FOR FURTHER ACTIVITIES

4.1 Recommendations to Tekes

1. Tekes should try to develop more efficient knowledge and result capture and dissemination among the projects and towards industry. Such an effort in any technology programme would result (1) increase in learning in the projects, between the projects as well as in the industry, (2) increase in the rate of the change in moving towards the objectives of the technology programme.

2. The key components for such knowledge capturing tool are suggested to be: knowledge bank of the projects, resources for collecting the knowledge and learning from the projects, focus on content and quality of the information disseminated. Creation of toolboxes for different types of companies based on their needs would then enable the use and dissemination of knowledge. Contents of the toolbox should include a developing plan, resources, "how to" guides, training needs, information management, development of IT infrastructure and standards. If this could be achieved, Finnish technology programmes would be even more powerful model for other countries to follow.

3. In general, the interaction between projects needs to be enhanced. Tekes should address this issue by modifying the demands of interaction and openness in the projects, which are participating in technology programmes. On the other hand this is also a delicate issue, which must be considered carefully to avoid possible negative effects, like unwillingness to participate technology programmes in the leading companies if they see that they would loose their competitiveness by sharing all information.

4. Strong co-operation between the other related technology programmes, in this case mainly between Vera, Rembrand, ProBuild and Healthy Building. The steering groups of all the related real estate cluster programmes and Tekes must address this issue and decide the roles and the relationships of the programmes. As a result of the recent development in the palette of technology programmes on this particular field Tekes has already started this development in co-operation.

4.2 Recommendations to the VERA programme

1. The Steering Committee needs to define and to separate the different objectives and their levels to quantify the objectives and to build a value model on the identified objectives.

The TIMI project (Benefits of IT in Construction) [3] in VERA could be a potential tool for establishing a common basis of measurement for all VERA projects.

2. The Steering Committee should develop and apply a change-management strategy for the key parts of VERA. The key components for such strategy would be the knowledge bank described in recommendations to Tekes.

3. The organisations participating in VERA should develop and apply a change-management strategy (human issues, metrics, nature of the business, supporting IT) inside their companies as well. This would enable the companies to adapt much more efficiently and comprehensively the new ways of thinking, acting and doing business as a whole.

4. The Steering Committee needs to enhance the re-engineered processes and the life cycle concept - particularly piloting. The process models are not, however, an end in their own right. They are the tool by which the delivery of construction and facility operation is controlled. It is suggested that VERA programme amends the goal of the re-engineered processes as "the development of process management tools will enable the control of production based on common process models".

5. There seems to be a need for tailored information, especially for the information concerning IFC, which seemed to have many interpretation and ignorance prevails among the projects that were not involved with the issue. The step to actively engage in and grasp the information provided by the IAI appeared to be high for the ordinary project participants. More informing and activating is also needed towards the real estate owners.

6. In general, the interaction between VERA-projects needs to be enhanced as the projects themselves found the interaction and co-operation weak between the projects. The Steering Committee should therefore address this issue by sharpening the activation strategy of VERA. How ever, in the current Tekes funding system the project participants and the industry must be more active themselves.

7. Start-up meetings for the projects and bettering the overall project management of VERA-projects are also suggested. Realising this being mainly a responsibility of the projects, VERA could, however, arrange some supporting activities such as start-up workshops for the projects. The workshops could have sessions such as awareness building, scoping and co-ordination. The projects themselves, on the other hand, must be active to attend and give feedback from the workshops as well as pay more attention to the project management as a whole.

8. Emphasis on training and education is needed in general on the issues of VERA. Also the awareness of Finnish research and development projects in general was seen very low in the construction and real estate fields. There seemed to be disconnection between the industry and academia. On the bottom line it is, though, a question of the role of a technology programme whether it is its responsibility to focus on training and education and informing about other research and development projects in the field.

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